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AIRS, AMSU-A, and Aqua Spacecraft Hardware Status

AIRS Level 1 Software Status

Denis Elliott

March 22, 2016

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AIRS Status

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AIRS Operational Status

- **AIRS is in excellent health**
- **All available engineering parameter plots versus time are either flat or changing extremely slowly—no concerns**
- **Cooler A status remains unchanged since the anomaly of March 2014**
  - ***Cooler does not update engineering telemetry or respond to commands***
  - ***Compressor is running and focal plane temperature is as desired***
  - ***Science data quality remains excellent***

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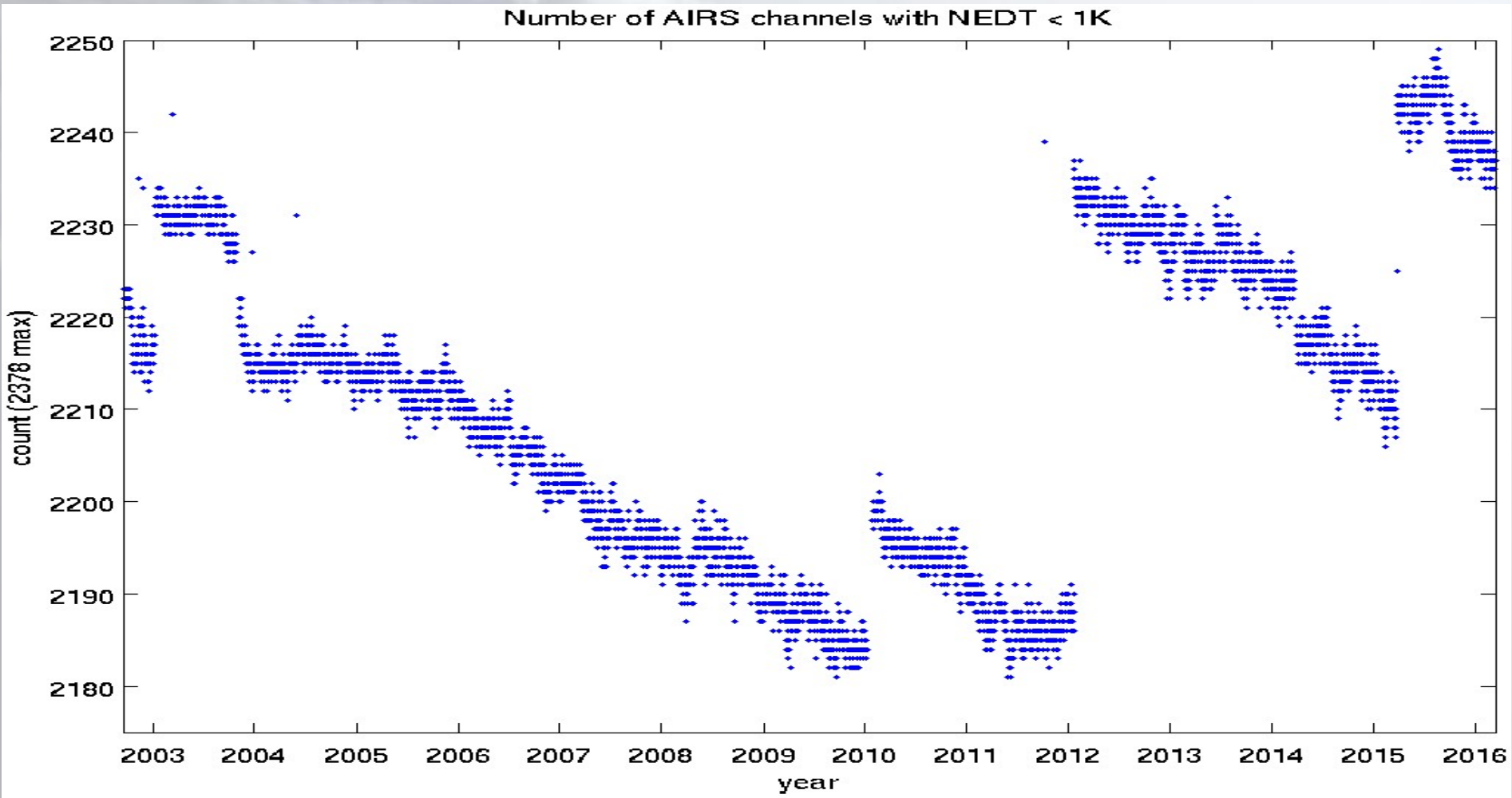
Number of AIRS channels with NEΔT < 1K



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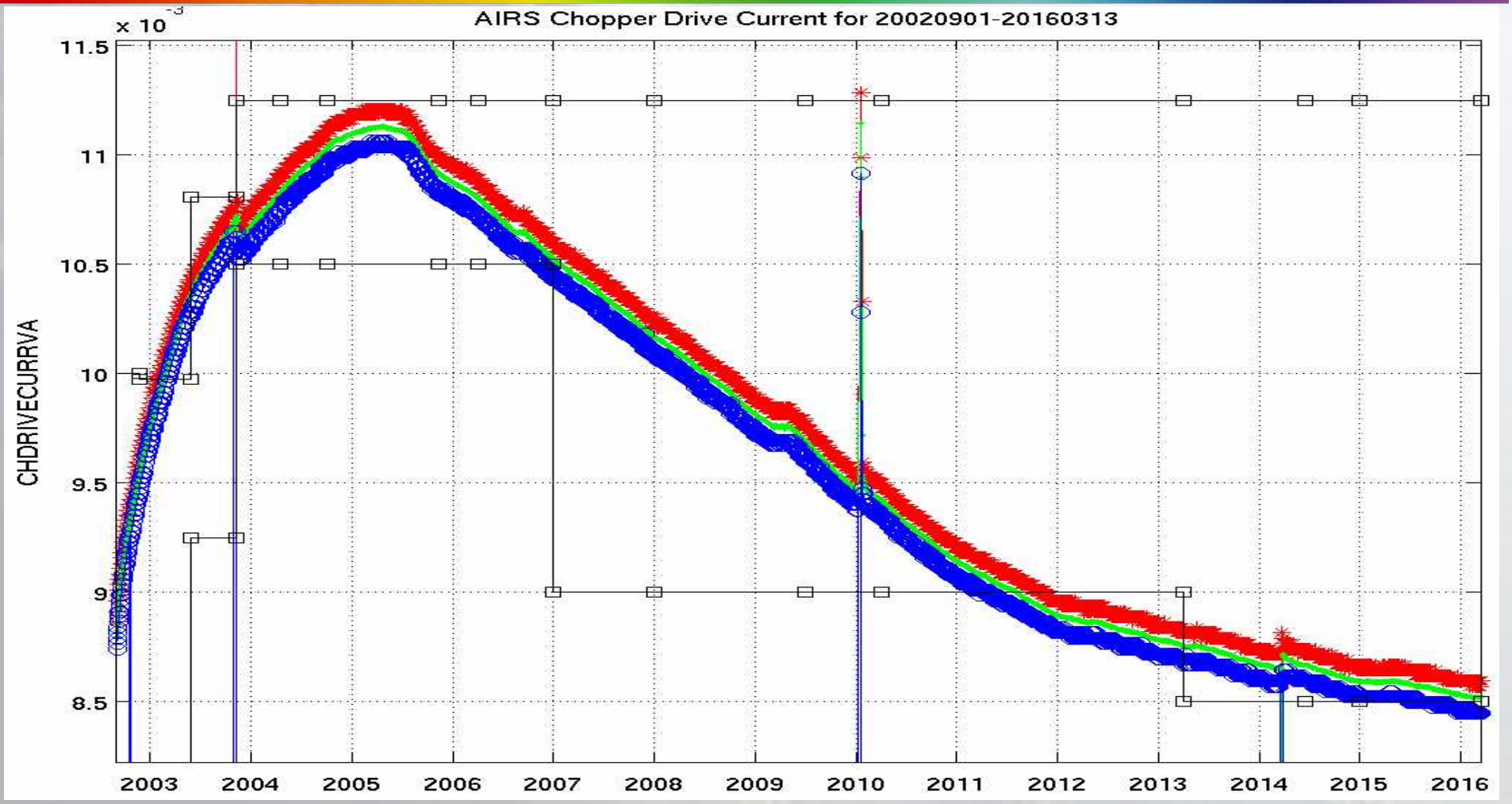
AIRS Chopper Drive Current



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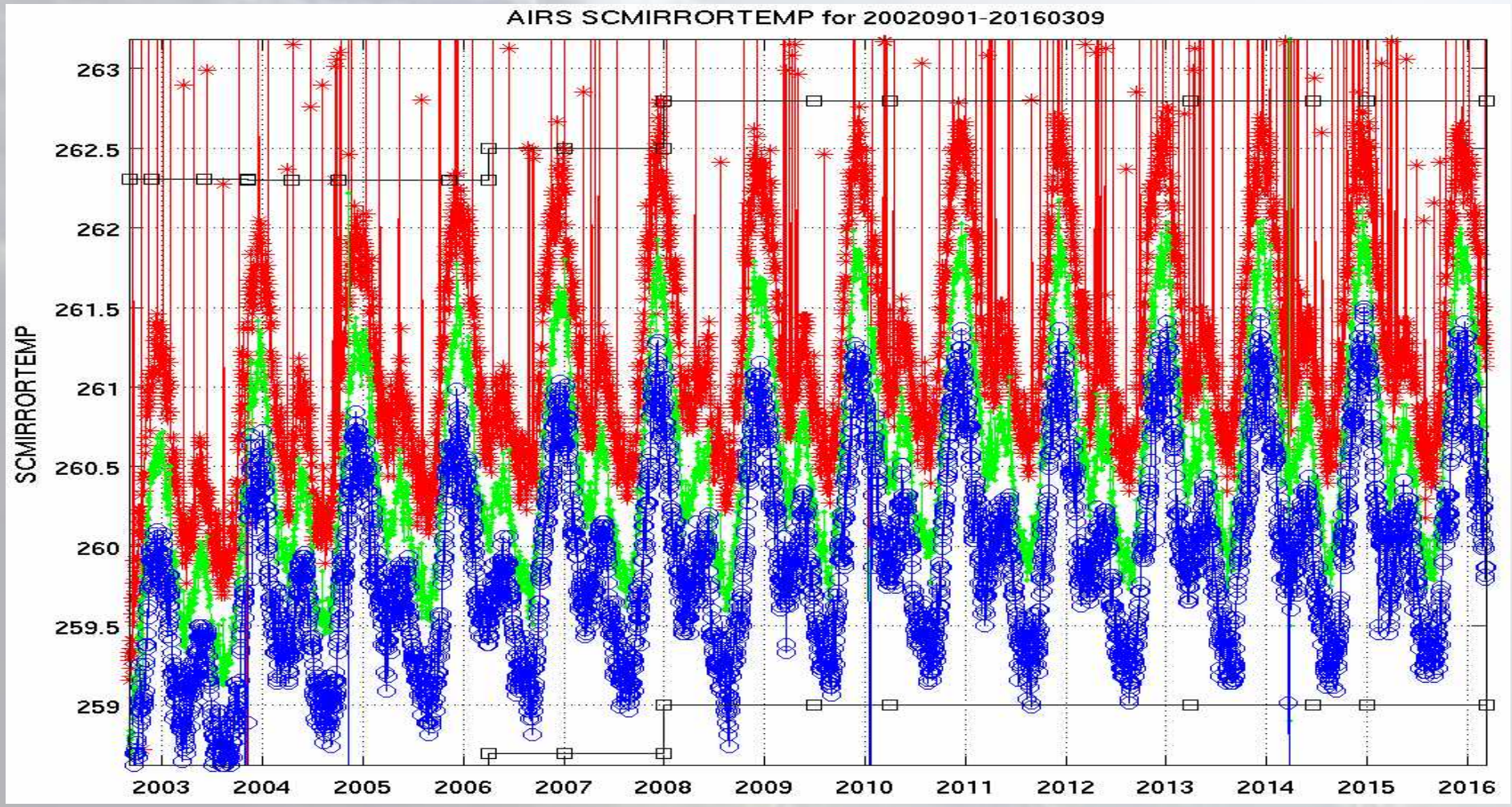
AIRS Scan Mirror Temperature



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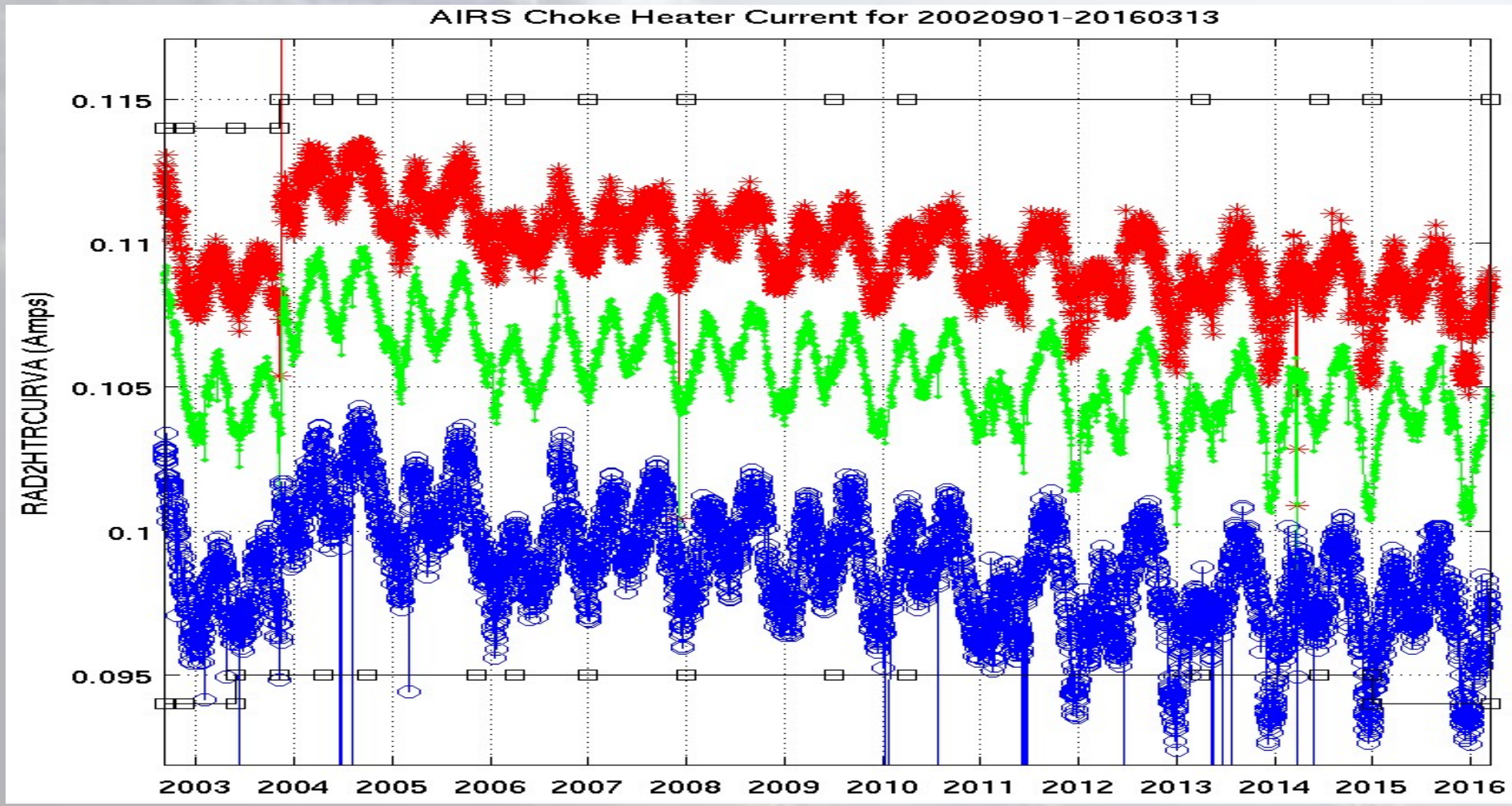
AIRS Choke Point Heater Current



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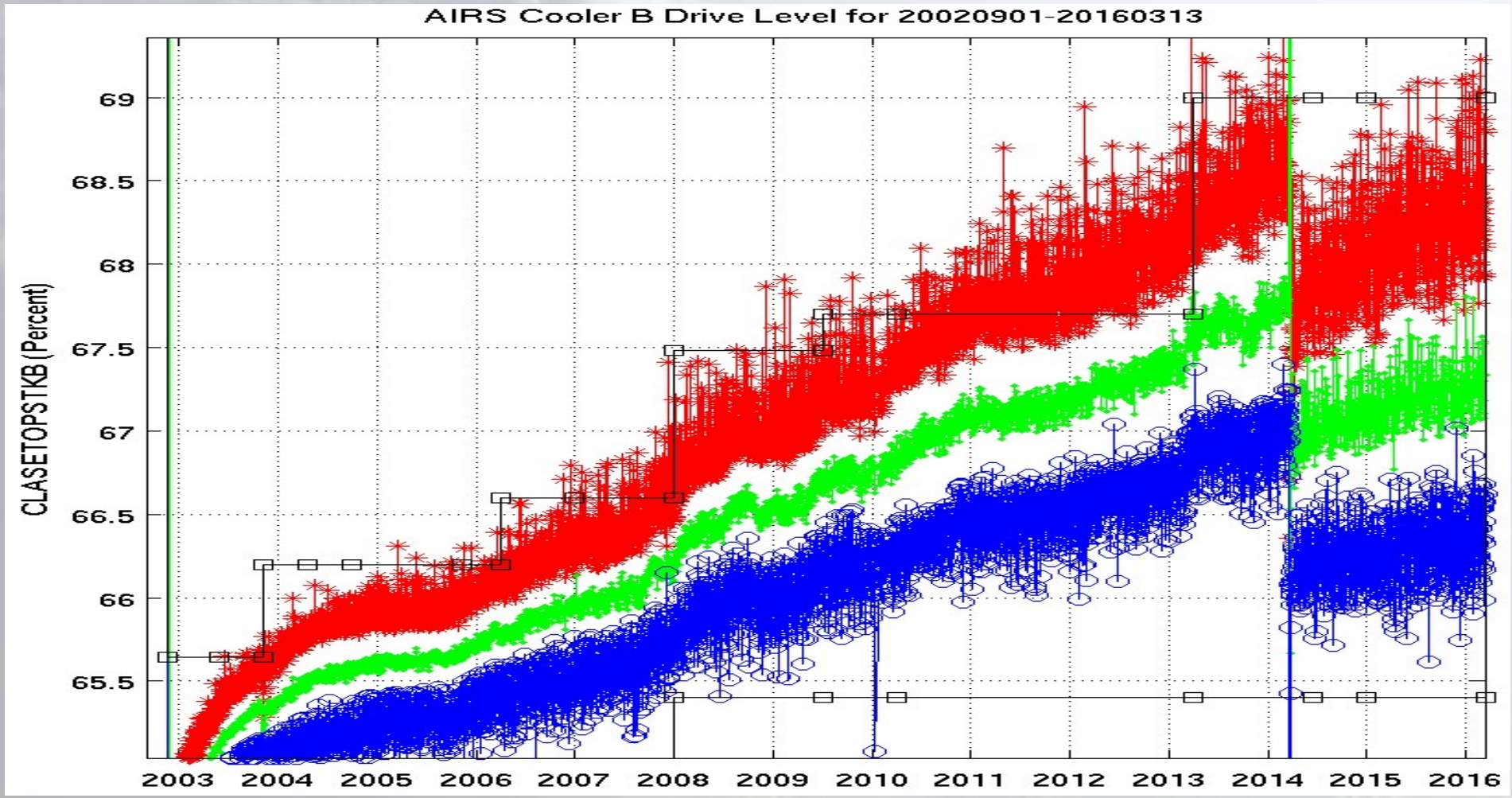
AIRS Cooler B Drive Level



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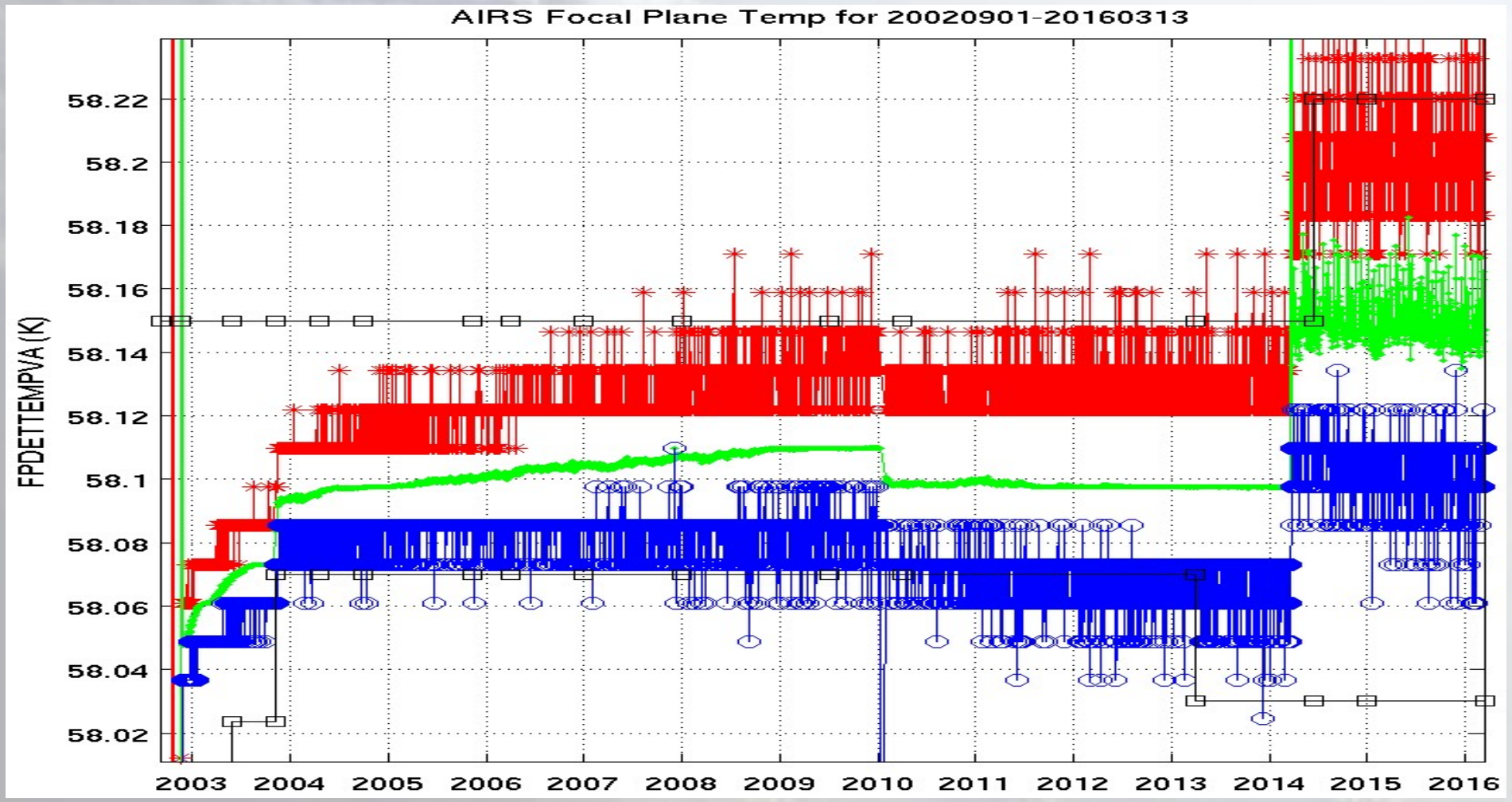
AIRS Focal Plane Temperature



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AMSU-A Status

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AMSU-A Operational Status

- AMSU-A mechanical parts and most of the electronics are in good health
- All engineering parameter trends are slow
- The A1-1 and A1-2 scanner currents are rising, but very slowly and are not alarming
- 8 of the 15 channels are perfectly healthy with no noise increase at all, but
  - *Channel 4 failed in 2007 (declared non-operational on October 1 2007)*
  - *Channel 5 is now too noisy to contribute to Level 2*
  - *Channel 7 noise has exceeded specs since launch and has never been used for L2*
  - *Channel 6 noise has been increasing slowly since 2008, but is still a good channel*
  - *Channel 9 experienced occasional small bursts of noise early in the mission and is now experiencing them again, but it is still good*
  - *Channel 1 began experiencing increased noise in January 2012, seemed to recover, but its noise jumped up some in mid-2015—it is still good*
  - *Channel 2 also began experiencing increased noise in early 2012—its changes are even slower than Channel 1—it is still good*

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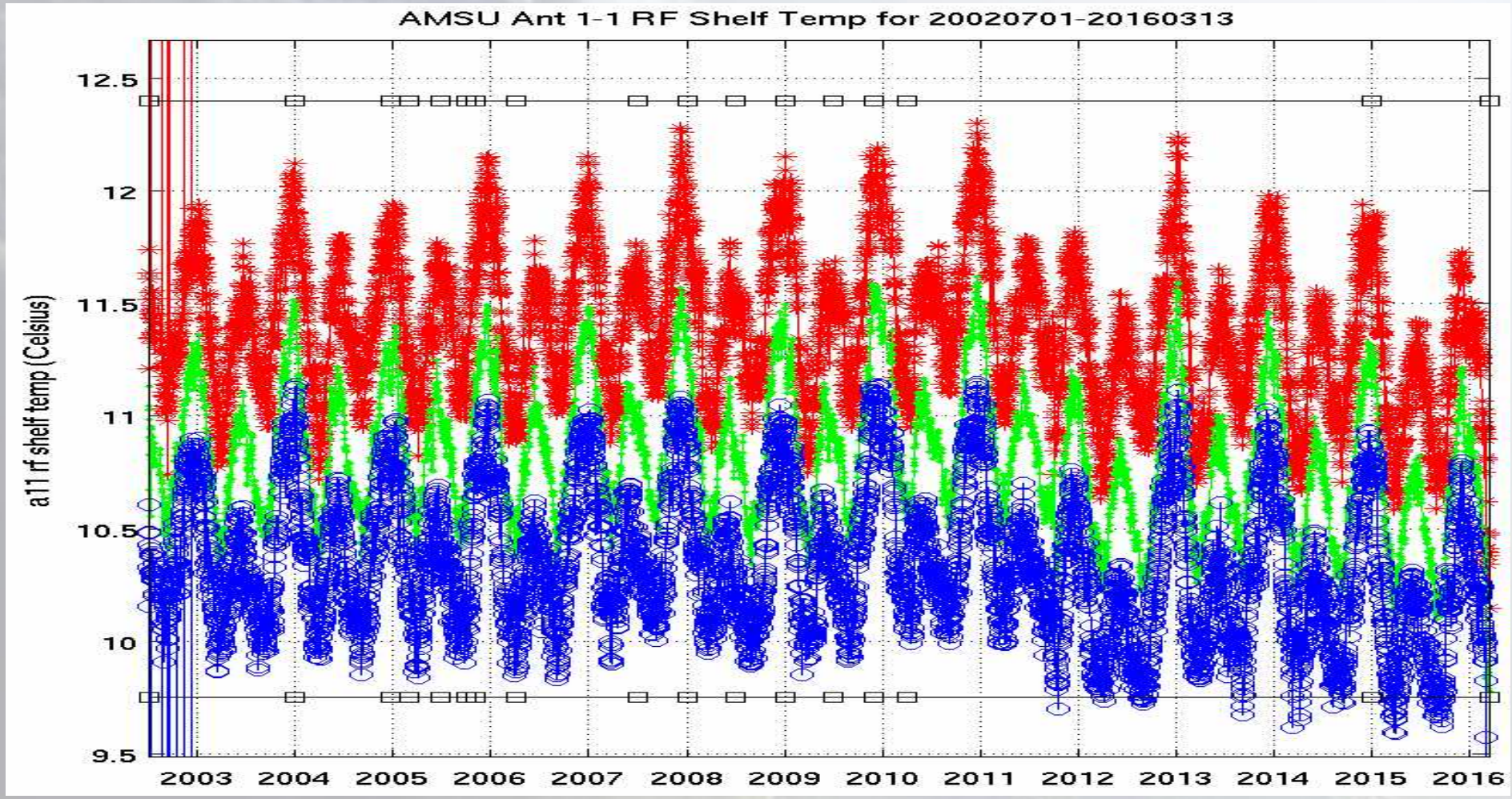
AMSU-A1-1 RF Shelf Temperature



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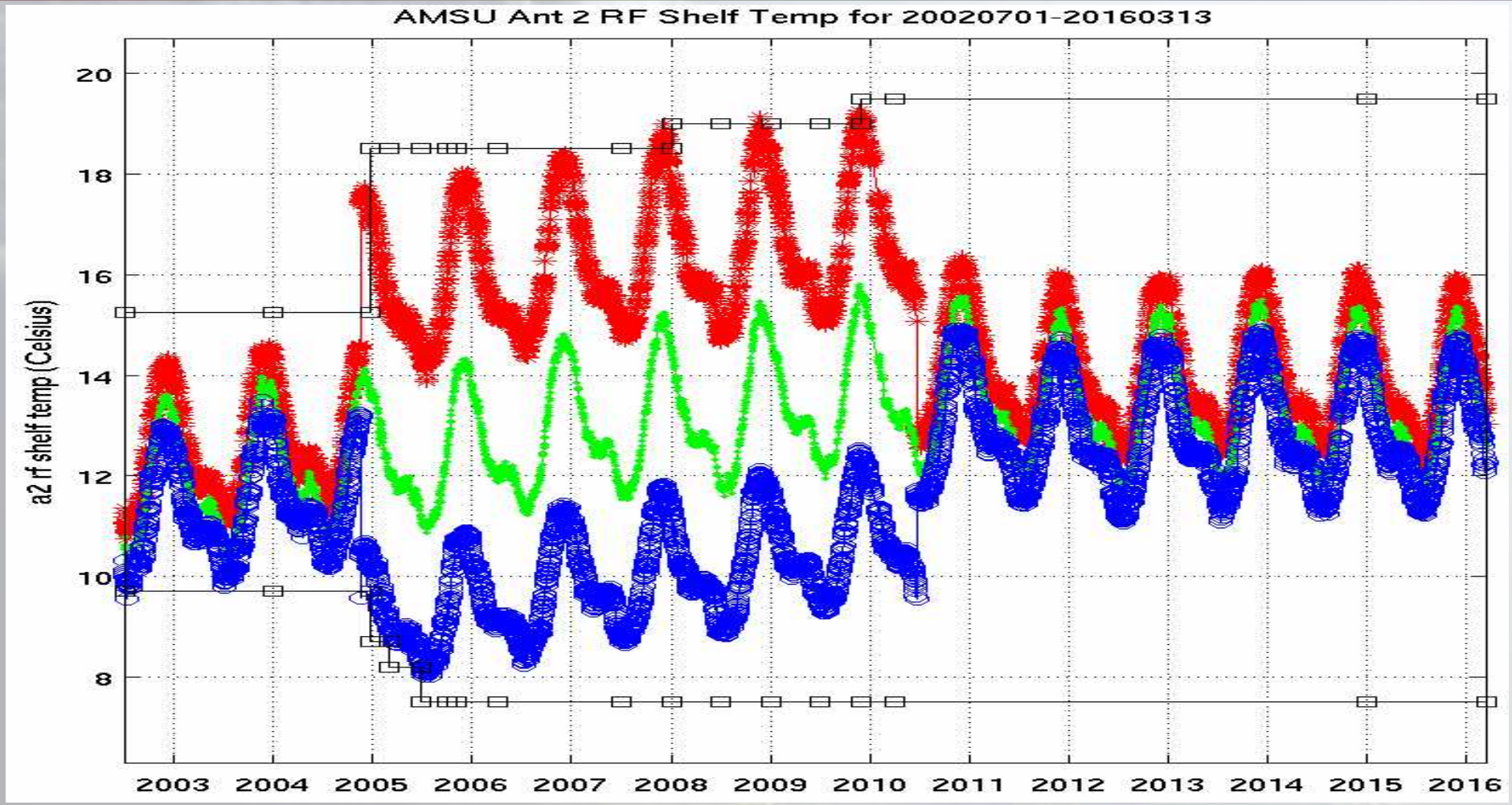
AMSU-A2 RF Shelf Temperature



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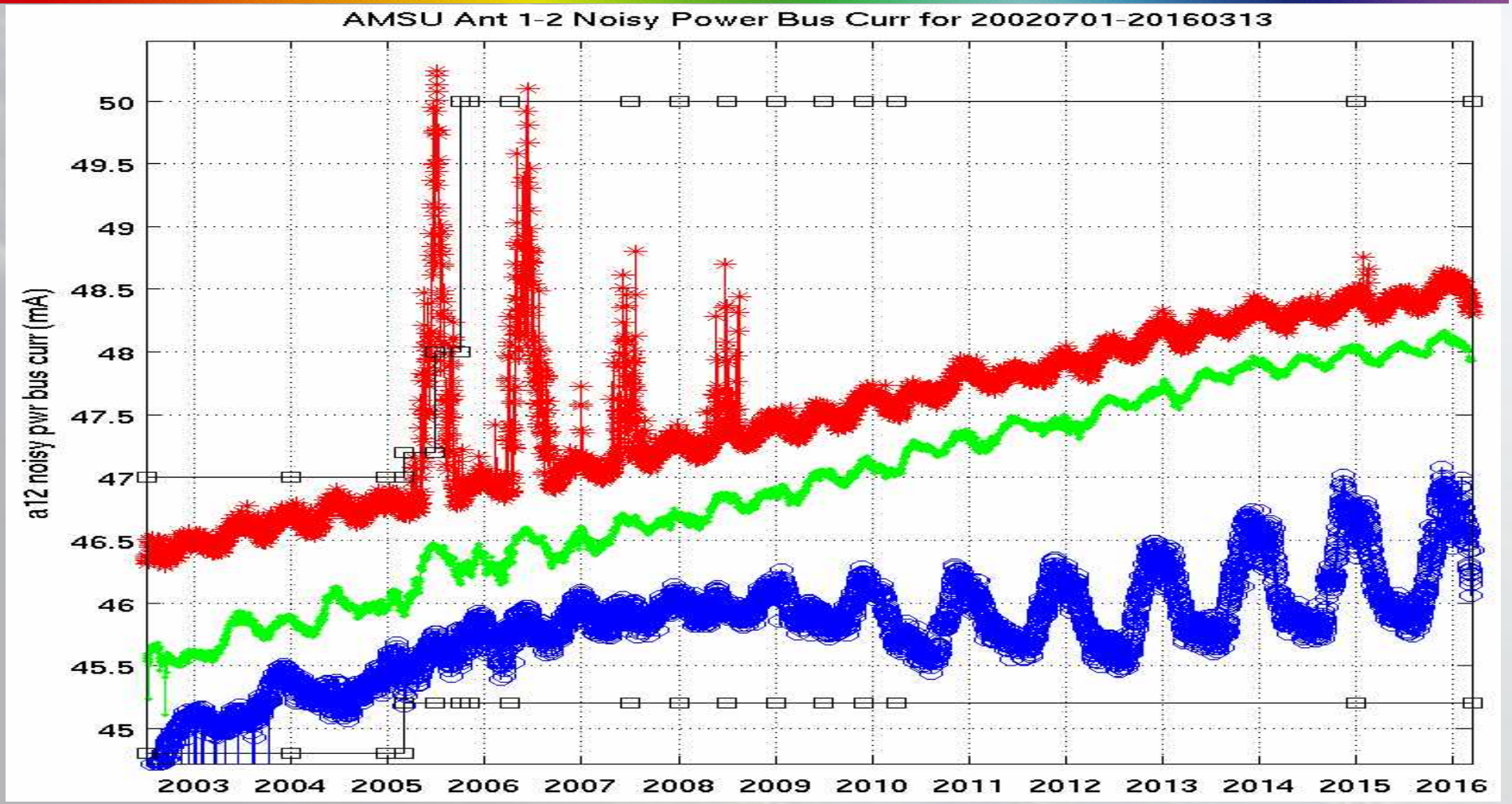
AMSU-A1-2 Noisy Bus Current



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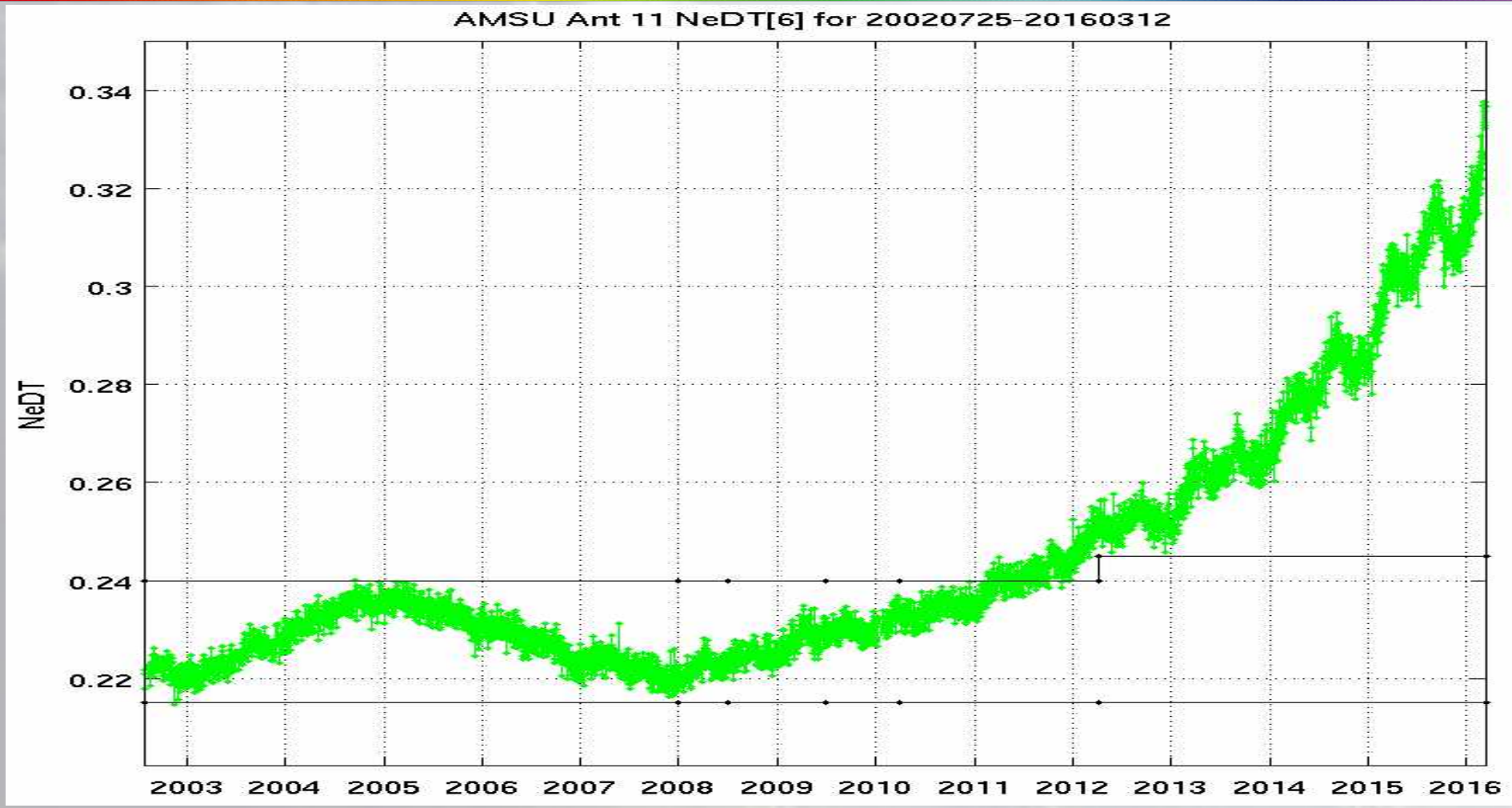
AMSU-A Channel 6 NEΔT



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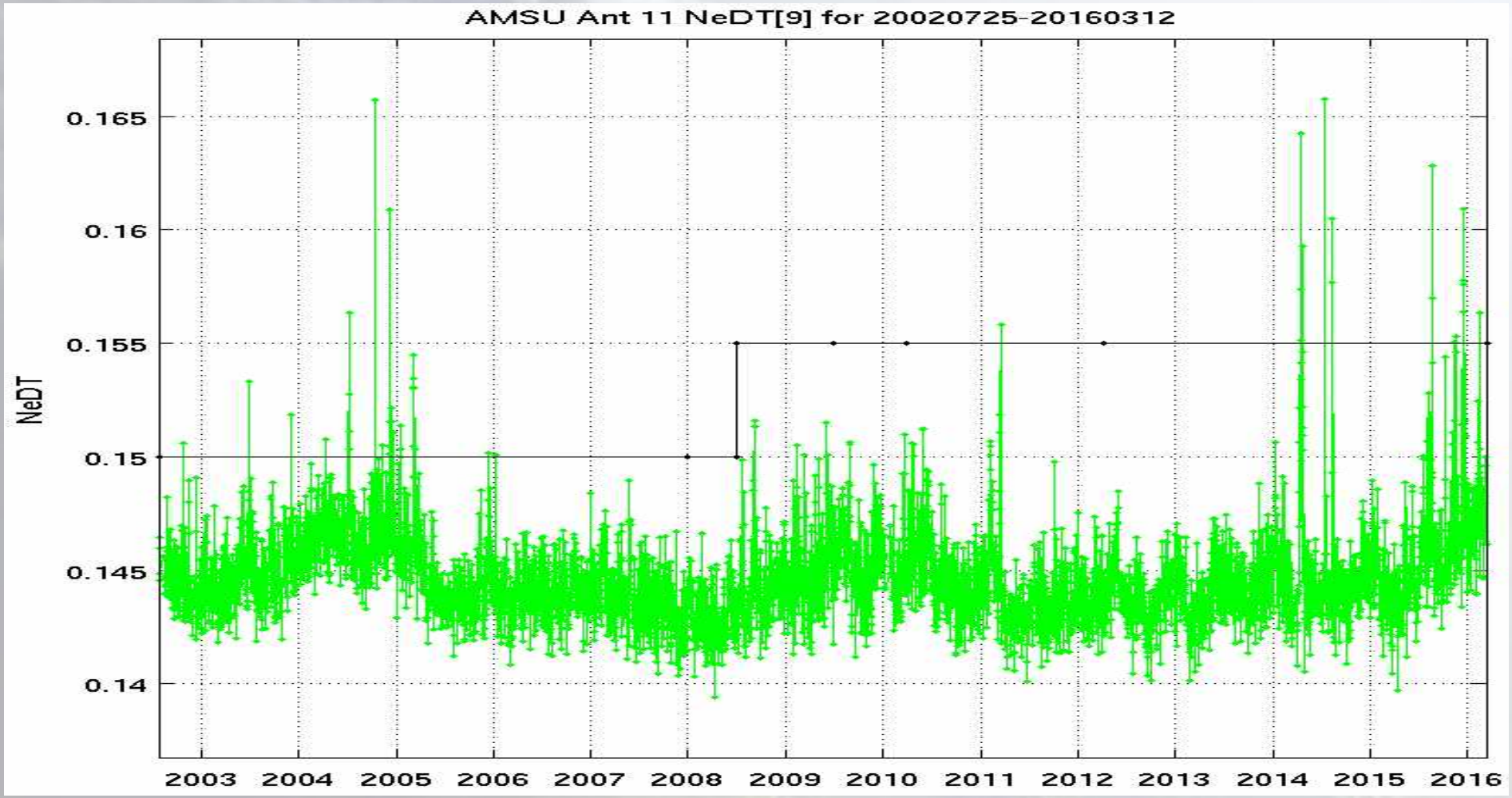
AMSU-A Channel 9 NEΔT



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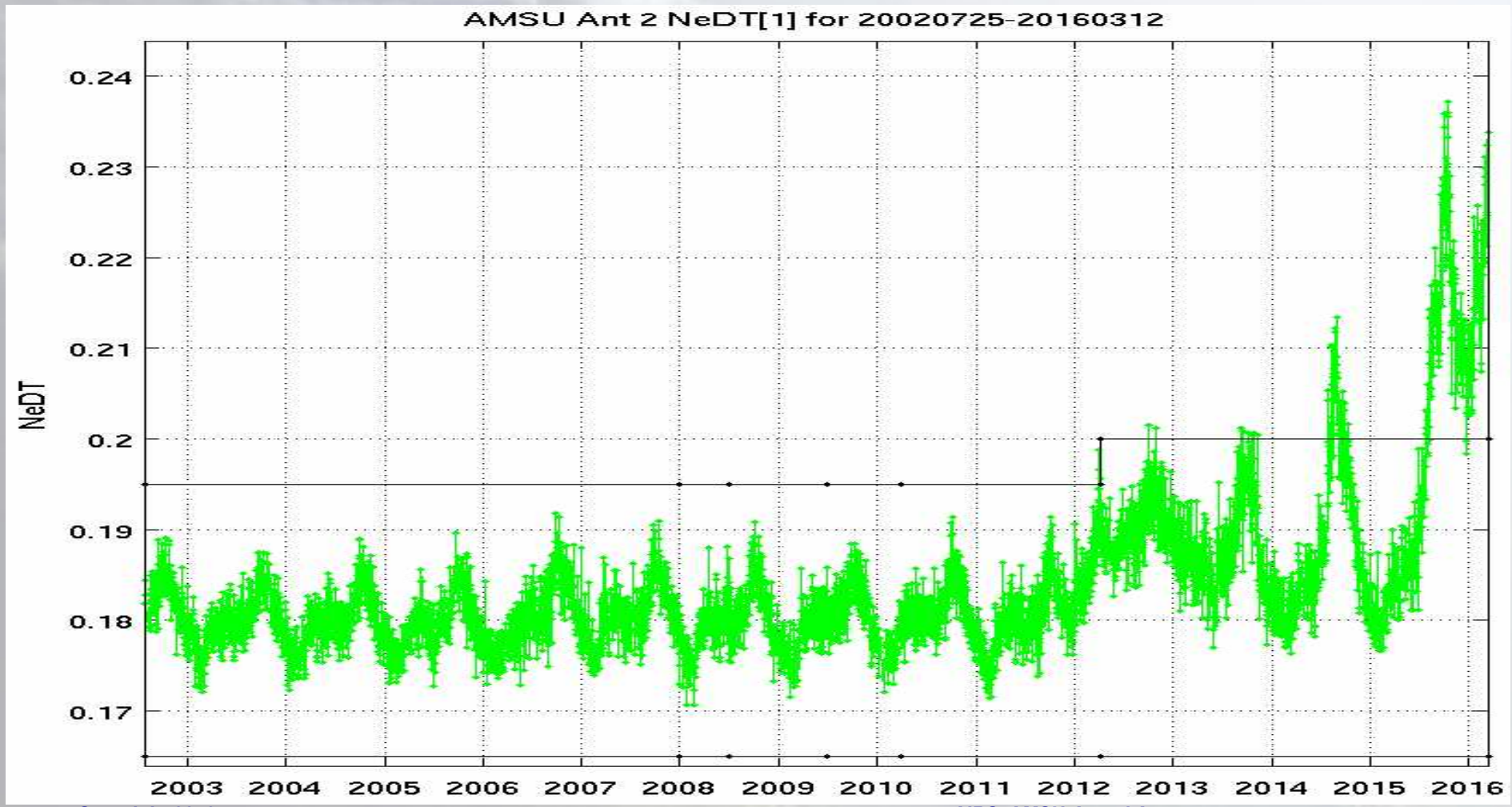
AMSU-A Channel 1 NEΔT



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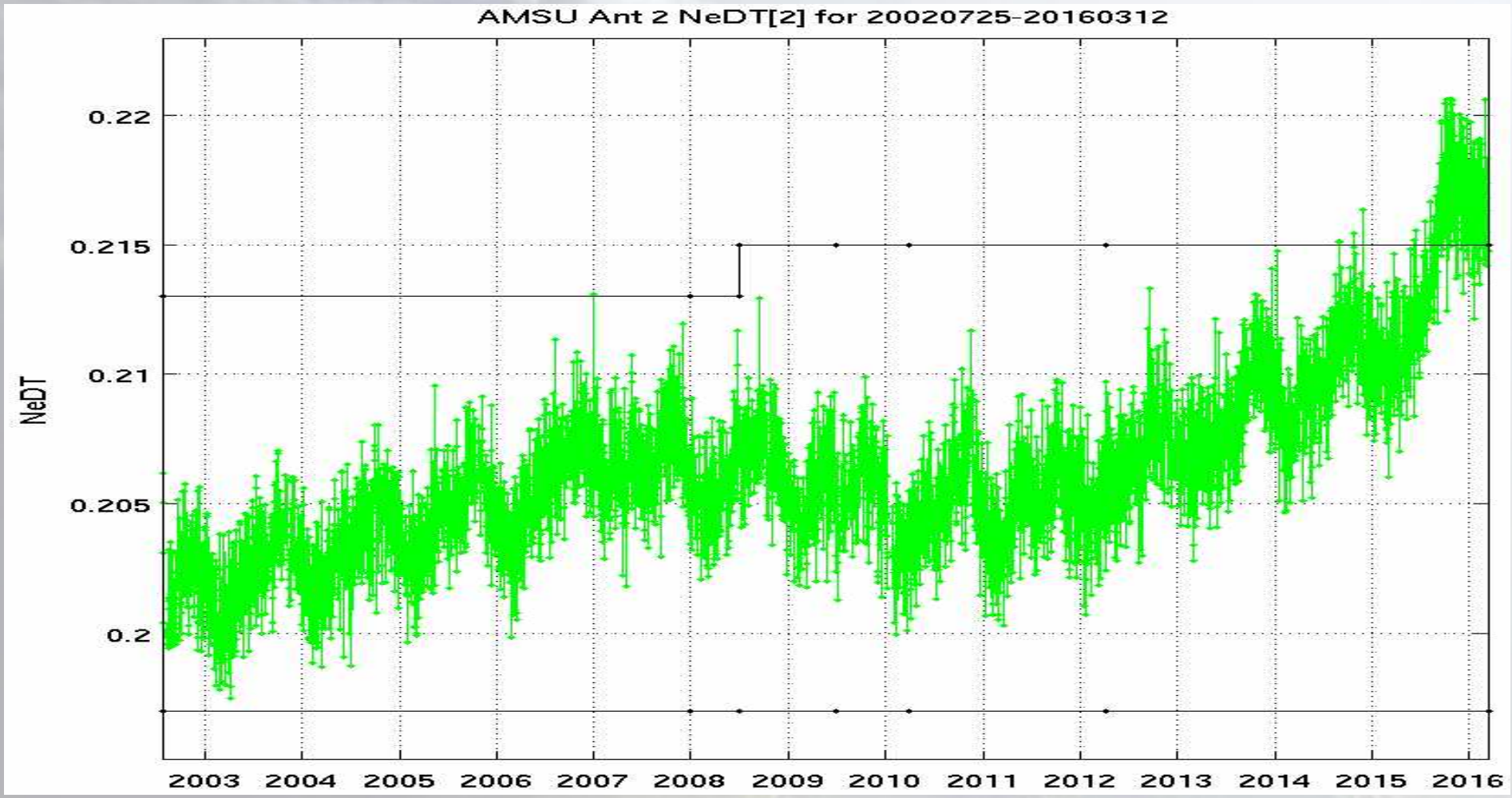
AMSU-A Channel 2 NEΔT



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Aqua Status And Anomalies

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Aqua Spacecraft Health Status

- **Aqua is in very good health**
- **Several anomalies have occurred over the years, but none have impacted operations yet**
  - ***Solar array***
    - Potentiometers used for orientation are noisy
    - Thermistor failure on one panel
    - Solar cell arrays
      - *have lost **13** strings of solar cells (out of 132 on the spacecraft)*
      - *there is no impact to mission operations at this time*
  - ***FMU/SSR hardware timeouts***
  - ***Battery***
    - Pressure too high early in mission but now in control
    - Power from one cell behaved erratically for several years but now seems OK
    - Temperature of one cell was high for part of a day
  - ***Computer memory bit errors***

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Aqua Fuel Supply

- **Occasional drag make up burns use only a very small amount of fuel**
- **Most fuel usage takes place in orbital inclination adjustment maneuvers, needed to keep Aqua properly aligned with other A-train instruments and to tightly control our 1:30 pm crossing time**
  - ***Three or four such maneuvers are planned every year, near the vernal equinox***
  - ***The most recent estimate of future fuel usage indicates that the hydrazine should last at least until 2021, and possibly longer***
  - ***The plot on the next page was made before the Spring 2015 inclination adjustments, but it is the most recent available***

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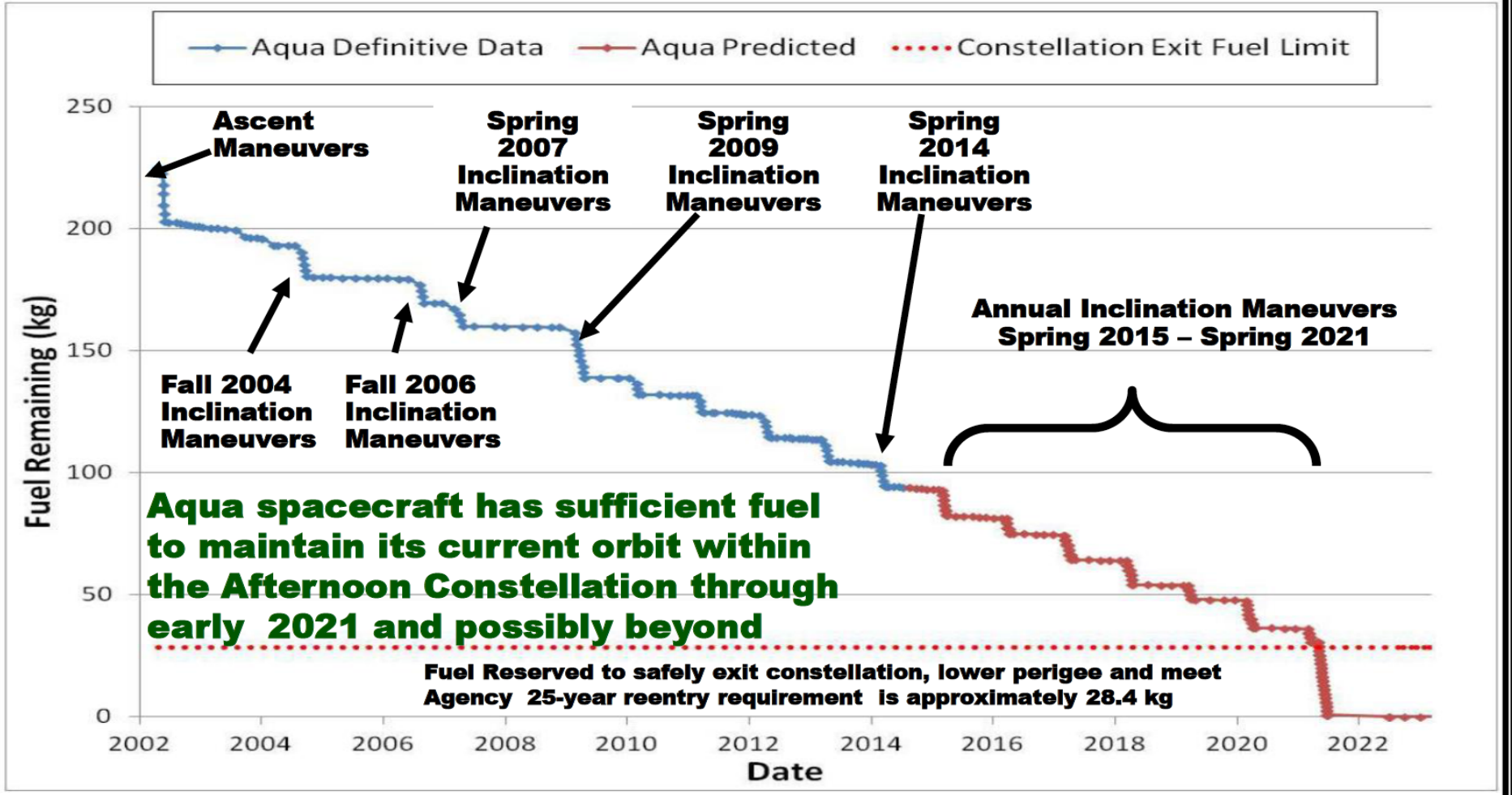
Projected Aqua Fuel Usage



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AMSR-E status

- Antenna anomaly forced turning off AMSR-E in October 2011
- Instrument powered back on (but antenna not restarted) in February 2012
- In December 2012 the antenna was restarted, but spinning at only 2 rpm (nominal was 40 rpm)
- The instrument was permanently powered off on February 3, 2016

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Level 1 Software

Courtesy of Evan Manning and George Aumann

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Level 1B

- **No major changes affecting radiances are envisioned**
- **Improvements in some L1B parameters are planned**
  - ***Non-gaussian noise***
  - ***C_{ij} flag***
  - ***"Do not use for L2"***
- **The SRF frequencies in the output file remain the nominal ones**
  - ***True frequencies are in a table***
  - ***The differences are less than 1% of the SRF width—ignoring the shift results in a brightness temperature error of less than 0.1 K except on the sides of lines***

Level 1C

- First version is available—does cleaning and gap filling well
  - *At the GES DISC they maintain a rolling 1-month of products*
  - *At JPL we have a complete record from April 21, 2015 to present*
- This version needs improvement handling the C_{ij} correction
  - *Possible improvements are being tested*
- Resampling radiances to a fixed frequency grid is planned for the next release—the algorithm is under development

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Non-periodic spectral shift for whole mission From Larrabee Strow

- The overall shift is very small
- The existing exponential decay model remains good for continued use
- Short period effects (such as orbital) are not shown—they are on the same order or smaller than the seasonal shift

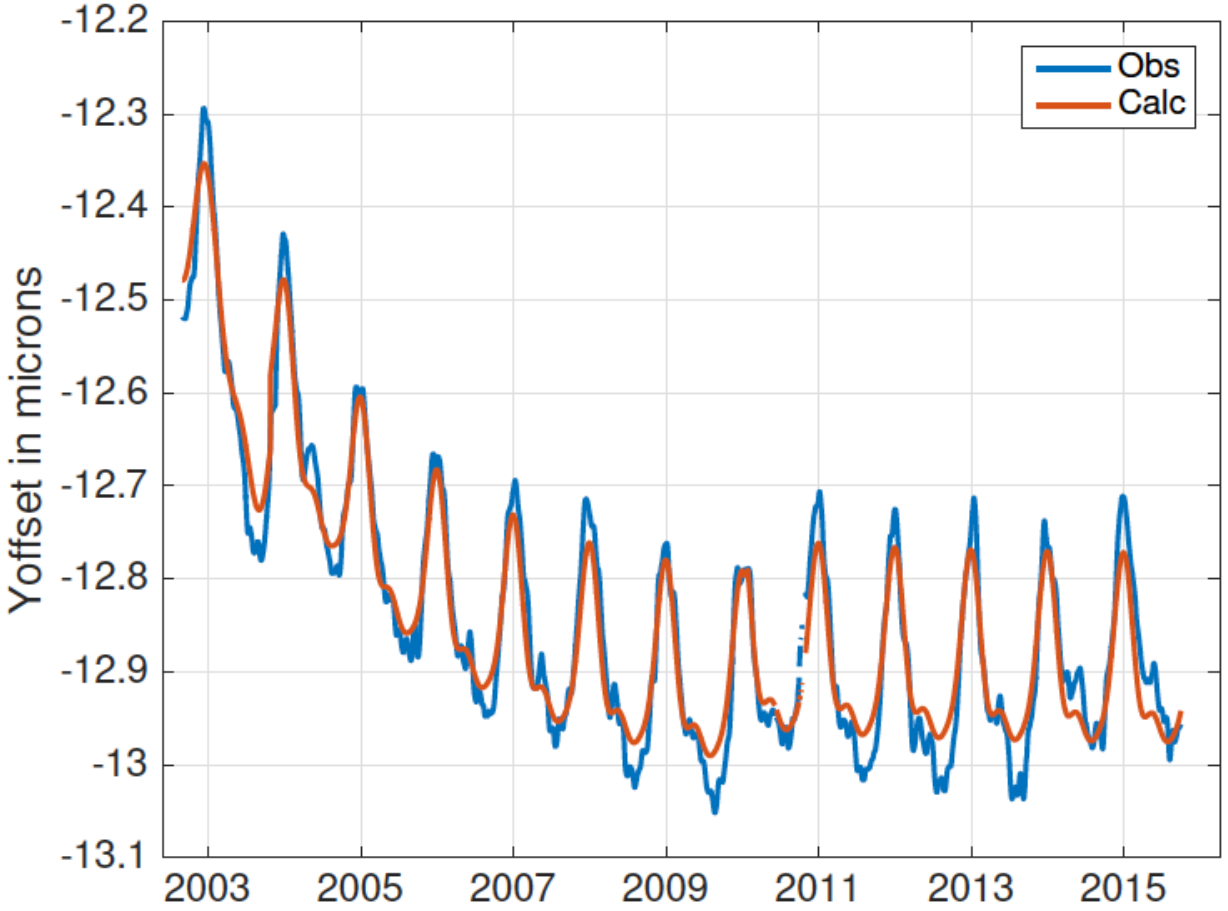

Figure 1: Relative variation in module M3 from clear-ocean spectra compared to output of get_yoff.m

Level 1D

- Major new development
- Intended to align AIRS and CrIS SRF and spectral sample positions by degrading both to the lowest common denominator
- Still in the conceptual stage
- This may work better with CrIS Full Resolution mode data